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PTO/SB/05 (4/98)
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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 C.F.R. § 1.53(b))

Attorney Docket No. EFIM0069CIP

First Inventor or Application Identifier Motamed et al.

Title Printing Method and Apparatus Having Multiple Raster ...

Express Mail Label No. EL441831940US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. ☒ * Fee Transmittal Form (e.g., PTO/SB/17)
(Submit an original and a duplicate for fee processing)2. ☒ Specification [Total Pages 18]
(preferred arrangement set forth below)

- Descriptive title of the Invention
- Cross References to Related Applications
- Statement Regarding Fed sponsored R & D
- Reference to Microfiche Appendix
- Background of the Invention
- Brief Summary of the Invention
- Brief Description of the Drawings (if filed)
- Detailed Description
- Claim(s)
- Abstract of the Disclosure

3. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets 3]

4. Oath or Declaration [Total Pages 2]

- a. ☐ Newly executed (original or copy)
- b. ☐ Copy from a prior application (37 C.F.R. § 1.63(d))
(for continuation/divisional with Box 16 completed)
- i. ☐ DELETION OF INVENTOR(S)
Signed statement attached deleting
inventor(s) named in the prior application,
see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b).

* NOTE FOR ITEMS 1 & 13: IN ORDER TO BE ENTITLED TO PAY SMALL ENTITY
FEES, A SMALL ENTITY STATEMENT IS REQUIRED (37 C.F.R. § 1.27), EXCEPT
IF ONE FILED IN A PRIOR APPLICATION IS RELIED UPON (37 C.F.R. § 1.28).

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5. ☐ Microfiche Computer Program (Appendix)6. Nucleotide and/or Amino Acid Sequence Submission
(if applicable, all necessary)

- a. ☐ Computer Readable Copy
- b. ☐ Paper Copy (identical to computer copy)
- c. ☐ Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

7. ☐ Assignment Papers (cover sheet & document(s))8. ☐ 37 C.F.R. § 3.73(b) Statement ☒ Power of
(when there is an assignee) Attorney9. ☐ English Translation Document (if applicable)10. ☐ Information Disclosure ☐ Copies of IDS
Statement (IDS)/PTO-1449 Citations11. ☐ Preliminary Amendment12. ☒ Return Receipt Postcard (MPEP 503)
(Should be specifically itemized)13. ☐ * Small Entity ☐ Statement filed in prior application,
Statement(s) Status still proper and desired
(PTO/SB/09-12)14. ☐ Certified Copy of Priority Document(s)
(if foreign priority is claimed)15. ☐ Other: _____

16. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in a preliminary amendment:

☐ Continuation ☐ Divisional ☒ Continuation-in-part (CIP) of prior application No. 09 / 298,639

Prior application information: Examiner Unknown Group / Art Unit: 2711

For CONTINUATION or DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied
under Box 4b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by
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5 **PRINTING METHOD AND APPARATUS HAVING MULTIPLE RASTER
 IMAGE PROCESSORS**

This application is a Continuation-in-Part of co-pending U.S. Application No. 09/298,639
filed on April 23, 1999.

10

BACKGROUND OF THE INVENTION

TECHNICAL FIELD

15 The invention relates to the printing of images, which exist in a digital electronic format. More
particularly, the invention relates to a printing method and apparatus that supports automatic
print loading, cluster printing, and other optional components.

DESCRIPTION OF THE PRIOR ART

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25

30

Every image that exists in a digital electronic format is made of picture elements. At some
point, all such digital image data, whether expressed as vector format data or bitmap format
data, must be rendered into pixels for display on a monitor or for printing on a printer. All
images, therefore, have pixels as their base. Rendering, or translating the digital data into
physical output, is the most important part of realizing such images. The term raster image
processing (RIP) refers to the process of translating digital image data into physical visual
images and graphics. Fig. 1 is a block schematic diagram showing a conventional raster
imaging processor in which raster images are images composed of lines of pixels. In raster
image processing, each horizontal line of bitmap image pixel information is referred to as a
scan line or raster line. In Fig. 1, Postscript® lines 10 and/or digital RGB or CMYK pixels
12 are shown processed by associated RIPs 13-15 to produce information that results in a
physical output 16.

35

The simplest output devices translate only one raster line at a time and then output that line
to film, paper, or a monitor. Fig. 2 is an illustration of an image 20 and a single raster line 22
as processed by such device. More efficient RIP techniques analyze an image all at one
time and convert the image information into visual output.

40

The RIP is a program that may be embedded in hardware or the may exist entirely in
software. A hardware RIP is a computer which is attached to an output device and which is

5 dedicated to translating digital image data for output. Image data is sent from a workstation
to a computer that is attached to the output device. The hardware RIP program which
resides in this computer interprets the image data and provides raw on/off instructions to the
output device. The actual interpreter may be any program that translates image information
10 by Adobe Corporation of Mountain View, California is commonly used in raster image
processing.

A software RIP performs many of the same functions as a hardware RIP. The software RIP
is usually located at a workstation that is not necessarily dedicated solely to the RIP function.
15 The software RIP interprets the digital image data and produces therefrom information that is
required for the output device to function properly. A major disadvantage of software RIPs
is that the workstation may not be configured to perform at speeds equal to a dedicated
hardware RIP. Software RIPs are also presently less desirable for larger print facilities
because such RIPs usually require a large amount of free hard disk space on the
20 workstation. Such hard disk storage is necessary because all of the digital data that are
processed must be saved before they are sent to the output device.

The RIPing process is complex and much of the output device rating is based upon the
device's image processing speed. The speed of the interpreter or RIP is a major factor in
25 the efficiency of the entire image reproduction process. Because of the dedicated
computer, hardware RIPs are typically faster than software RIPs. Even so, it would be
advantageous to provide improvements in RIP architectures that increase processing
speed and efficiency.

30 SUMMARY OF THE INVENTION

The invention provides a printing method and apparatus, comprising a software application
that works with proprietary printing utilities, and that may include one or more additional
software components for adding additional printing technology. The invention also
35 comprises an automatic print load-balancing component in a centralized or distributed raster
image processing (RIP) printing environment that enables faster system performance over
single or multiple processors.

The invention comprises the following features:

5 Routes jobs to the most available printer based on color use, pages per minute, number of pages per said job, size, and number of copies for jobs already in a queue and number of copies of the job sent.

10 Automatically can split job copies across specified number of printers meeting job criteria.

Automatically can split a single copy that is a long job across more than one printer.

15 Supports mixed groups of printers, wherein they do not all need to be the same make and model.

Monitors the print job status and can redirect the job if an error occurs.

20 Supports job scheduling by allow a user to specify job priority, with password required for rush jobs, and to specify job rip and print scheduling in advance.

Supports specified non-proprietary black and white printers.

25 Other aspects and advantages of the invention will become apparent from the following detailed description in combination with the accompanying drawings, illustrating, by way of example, the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

30 Fig. 1 is a block schematic diagram of a conventional raster image processing system;

Fig. 2 is a drawing which illustrates the processing of a single raster image line;

35 Fig. 3 is a block schematic diagram of the components of a preferred embodiment according to the invention; and

Fig. 4 is a block schematic diagram of the components of a preferred embodiment according to the invention.

DETAILED DESCRIPTION OF THE INVENTION

Overview

Description.

The invention claimed herein provides a printing method and apparatus, comprising a software application that works with proprietary printing utilities, and that may include one or more additional software components for adding additional printing technology. The invention also comprises an automatic print load-balancing component in a centralized or distributed raster image processing (RIP) printing environment that enables faster system performance over single or multiple processors.

It is noted that when the claimed software application is linked to and ships with one or more additional printing software components, the collection can be viewed as a suite.

It is noted that the claimed invention operates in a distributed RIP environment, as well as a centralized RIP environment.

The preferred embodiment comprises, but is absolutely not limited to, the following features:

Load-Balancer: Automatic routing of jobs to the most available printer based on factors, such as, for example, color or black and white, pages per minute rates, the number of pages in a job, size of job, and copies for both the jobs already queued to print and the job to be sent. The decision is made to minimize the time to completely print out the job;

Load-Balancer: Automatic splitting of sets across more than one engine (e.g. copies 1-10 go to a first engine, and copies 11-20 go to a second engine). The goal is to route the job such that it will complete printing as soon as possible;

Load-Balancer: Automatic splitting of a single, long job, copy across more than one engine. The goal is to route the job such that it will complete printing as soon as possible;

5 Redirect On Error: Automatic redirection of a print job when a printer error occurs;

Job Scheduling: Specify job priority and time; and

10 Support for specified non-proprietary black and white printers, as well as support for mixed groups of printers, wherein they do not all need to be the same make and model.

15 The preferred embodiment is designed for high-volume corporate, CRD, and print-for-pay environments. In corporate environments, a proprietary linkable utility reports back the job status and printer choices, and in CRD and print-for-pay environments, another proprietary linkable utility provides a comprehensive view of printer and job status.

20 The preferred embodiment allows an administrator to designate a group of printers that can be used for hybrid printing (color and B&W), job load-balancing (1 copy, long job), or set load-balancing (many copies). The invention appears as a printer on a user's network and has a specific driver and PPD associated with it. From the user's perspective, printing to the preferred embodiment load-balancing printer follows the same process as printing to any other printer on a network.

25 When the claimed application software starts, it advertises itself as a virtual printer on the network. When a user prints to the virtual printer from their workstation, the job is printed to the claimed application software. During the decision phase, the claimed invention determines an optimum printer choice(s) and forwards the job accordingly. The preferred embodiment reports engine choices back to the user via the two proprietary print utilities
30 mentioned herein above.

35 Figure 3 displays a path a print job takes from a user's workstation 30 to a final printing on a network connected engine according to the preferred embodiment of the invention. The workflow from the user perspective is fairly simple. The user sets appropriate PPD options for a print job using a proprietary driver utility 30. To print using the claimed invention, the user selects the virtual printer application 31 from their application. The virtual printer 31 resides on a server, networked PC, or networked user workstation 32. In an optional embodiment, if the claimed application resides on a proprietary server, then the job gets sent to a proprietary engine 33.

- 5 Once the print job has been sent to the claimed application 31, the preferred embodiment of the invention makes all load-balancing decisions and sends the job on to the appropriate server/engines for printing 61-63. Once the job has been sent out by the claimed application, the user determines to which server(s)/engine(s) their job has been sent using proprietary utilities. If an error occurs that requires the job to be redirected according to the error protocol of the preferred embodiment, the proprietary utilities reflect the server/engine changes to the user.

15 Figure 4 is a block schematic diagram of the components of a preferred embodiment according to the invention, similar to Fig. 3. The claimed application 31 is linked to proprietary utilities 40-41, and linked to component printer software 42-43 to allow some or all of the load-balancing.

Affected Utilities.

- 20 The preferred embodiment requires no changes to proprietary setup software used with a proprietary server.

25 In the preferred embodiment, proprietary utilities log into the application in an identical manner to logging into the proprietary server. Jobs sent to the application are displayed in a utility's active jobs sections queue. The application is responsible for listing printers the state of and where the pieces of a load-balanced print job has been sent. Also, the utility's menu setup option allows an administrator to access the application's setup interface.

- 30 In the preferred embodiment, job logs for the claimed invention and proprietary servers are displayed through the utilities. For each claimed automatic load-balanced job, the job log lists the job and all printers that received pieces of the job. For each proprietary server included in the automatic load-balancing group, the job log lists only the piece of the job that was sent to that server.

- 35 In the preferred embodiment, a proprietary driver lists all PPD options that can be set on the claimed application. Changes made to PPD options through the driver are applied on a per-job basis.

Functional Requirements

40

5 A preferred embodiment of PPD Options.

In the preferred embodiment, PPD options that are specific to the claimed application are all detected by the driver utility. The preferred embodiment comprises, but is not limited to the following PPD options.

10

Print Settings. Selections comprise, but are not limited to:

15

Rush jobs which causes job to be printed as fast as possible, even if the engines in the group do not necessarily support all selected PPD options. A message dialog can appear informing the user of which PPD options are not supported.

20

Exact Match causes jobs only to be sent to engines within the selected group supporting the selected finishing equipment, including, for example, color vs. black & white, paper size, and the like. The user is informed if no match is made and reports the specific PPD choices that are not supported in the printer pool. A default PPD option is available.

25

Copy Split. If print job contains multiple copies, indicates whether to split the number of copies over a number of engines, or simply to print all copies on one engine. The PPD option is related to the Maximum Number Of Engines Per Job PPD option herein below. Selections comprise, but are not limited to:

30

Yes. Splits copies across engines. Causes the set of copies to be split and printed across all of the engines included in a selected printer group. Limits the set split to the number of printers specified in Maximum Number Of Engines Per Job PPD Option.

35

No. Causes all copies in the set to be printed to a single engine from a selected printer group. Default PPD setting. Default goal is to find the particular engine that prints the job the fastest.

40

Long Job Split. If print job consists of one copy of a file, indicates whether the file should be split to print across a number of engines, or simply to print all copies to one engine. Related to the Maximum Number of Engines Per Job PPD options. Selections comprise, but are not limited to:

5

No. Prints a long job on one engine. Causes the entire file to be printed from a single engine regardless of page length. Default PPD setting. Default goal is to find the one engine that will print the job the fastest.

10

Yes. Split long job across engines. If a file is greater than or equal to the number of pages set in application's setup, then the file is split up and printed among the different engines in the selected printer group. Restricted to the value set in the Maximum Number of Engines Per Job PPD.

15

Long Job Page Split Minimum. The Long Job Page Split Minimum field determines how long a single job must be before the application will split the single job. This value only applies to long jobs that have been printed as a single copy. The default value is 200. It is noted that Page Split Minimum is a claimed application setup option, not a PPD option.

20

Maximum Number of Engines Per Job.

25

Maximum number of engines/printers over which a job can be load-balanced comprise, but are not limited to: 2, 3, 4, ..., 24. PPD option applies to Set Split and Long Job Split PPD options cited herein above.

30

Reroute On Error

Yes. Allows an administrator to specify to automatically re-route a print job when an engine error based on Error Recovery Timeout described herein below occurs.

No.

35

Error Recovery Timeout.

40

Error Recovery Timeout is related to Reroute On Error PPD option described herein above. A timeout period is set in the claimed application and is used when an engine failure such as, for example, a paper jam error, out of paper error, and the like occurs. The purpose of the timeout period is to cause the claimed application to wait a period of time specified by the administrator before

5 redirecting a job to another load-balanced printer. The timeout period allows the engine operator time to correct the error condition before the job is redirected. It is noted that the Error Recovery Timeout is an application setup option, not a PPD option.

10 Priority

Normal. A job is RIPed and printed in the order received. Default PPD setting.

15 Fastest. A job is moved to the front of a load-balancing queue for processing. Fastest priority requires an administrator password to be entered.

Background. A job always lets other jobs move ahead of it in the queue (nice mode), and is only processed in deadtime (background), or when no other jobs are waiting.

20 Job Scheduling. The Job Schedule PPD allows a user to set a time and date that the job gets printed. The claimed application holds the print job until it is time to print. At that time, the job is inserted into a load-balance queue according to its priority described herein above.

25 Application Error Recovery.

30 In the preferred embodiment, and for proprietary servers loaded with the correct system software, errors detected on the claimed application jobs are passed back from the proprietary server to the claimed application. The error protocol is as follows:

Error Types

35 Engine problem. Engine problem comprises, but is not limited to paper jams, out of toner, out of paper, or any engine error code requiring attention. Engine problems are redirected according to the Error Protocol described herein below after Error Recovery Timeout has expired.

40 RIP related error.

5 Error Protocol.

Every time a claimed application's sent job's status changes within a proprietary server, the proprietary server sends the status to the claimed application. If a job's status is equal to Error as described herein above, the following steps apply:

- 10
1. The claimed application cancels the job on the printer.
 2. The claimed application excludes problem printer/engine from the list of available resources.
 - 15 3. The claimed application redirects print job to a new printer from the selected group.
 - 20 4. If claimed application is unable to redirect the job because the printer group contains only one engine, or because no other engines meet job's requirements, the job is canceled and the user is notified.

It is noted that error redirections are given priority. The claimed application completes load-balancing the current job and redirects the problem job before moving to the next job in its queue.

It is noted that the claimed application can further split a set load-balanced job (multiple copies) during redirection, but does not split a job load-balanced (1 copy long job) during redirection.

30 Application Workflow.

In the preferred embodiment, the workflow from the user perspective is fairly simple. The claimed application is set up on a user's workstation in the same manner that a proprietary server is set up on the user's workstation. The user sets the appropriate PPD options as described herein above for the job using the driver utility as described herein above. To print to the claimed application, the user selects the virtual printer associated with the claimed application from their application.

- 5 Once the print job is sent to the claimed application, the claimed application makes all load-balancing decisions and sends the job on to the appropriate server/engines for printing. Once the job is sent out by the claimed application, the user determines to which server(s)/engine(s) the job is sent by using a proprietary utility(s).
- 10 If an error occurs the job is required to be redirected according to the error protocol described herein above, and the proprietary utility(s) reflects the server(s)/engine(s) changes to the user.

Job Flow.

- 15 In a preferred embodiment, the claimed application software is installed on a networked PC, which meets appropriate system requirements. 1. When the claimed application is selected as the printer, a file is sent to the claimed application. The claimed application has a filter which parses the file. According to certain settings in the job PPD, then associated decisions are made during parsing. After optimum print job balancing is determined, the
- 20 job is forwarded over the network to the designated printer(s).

Installation and Setup

- 25 In the preferred embodiment, the claimed application software confirms that the assigned proprietary printers are the correct engine and revision. Administrative setup options are a part of the claimed application software.
- Information required for setting up the claimed application for automatic load-balancing in a
- 30 preferred embodiment are:

IP Addresses for Engines 1 thru N (Fig. 3, 34-36).

Device type for attached proprietary servers.

- 35 Optional external collator software.

Optional external scanner setup.

- 40 Claimed application printer groups setup.

5

Job ticket defaults.

Error Recovery Timeout.

- 10 It is noted that at installation, the claimed application in the preferred embodiment is placed in the networked PC or proprietary server's start-up group. The claimed application starts up when the PC or proprietary server is booted.

- 15 Although the invention is described herein with reference to the preferred embodiment, one skilled in the art will readily appreciate that other applications may be substituted for those set forth herein without departing from the spirit and scope of the present invention. Accordingly, the invention should only be limited by the Claims included below.

5

CLAIMS

1. A method for raster image processing (RIP), using an RIP printer software application installed on a networked computer, said RIP application adaptable to coordinate with a plurality of other component printer software applications associated with one or more printers, and said RIP application having at least one filter, comprising the steps of:
 - selecting said RIP application to print a job;
 - sending said job to said RIP application;
 - said filter parsing said job into one or more print pieces; and
 - forwarding said print pieces to said one or more designated printers.
2. The method of Claim 1, further comprising an engine if said networked computer is a proprietary server.
3. The method of Claim 1, wherein said other component printer applications comprise an optimum print job balancing component.
4. The method of Claim 1, further comprising the step of determining, interpreting, and implementing job PPD settings.
5. The method of Claim 1, wherein said RIP application works with a plurality of proprietary utilities.
6. The method of Claim 5, wherein said plurality of proprietary utilities comprises, but is not limited to:
 - a driver utility for a user to interact with said RIP application; and
 - a reporting utility for reporting job status and designated printer locations for said printer pieces.
7. The method of Claim 6, wherein said driver utility lists some or all of PPD options associated with said other component printer applications.
8. The method of Claim 7, wherein said PPD options apply on a per-job basis.
9. The method of Claim 3, by said optimum print job balancing component, further comprising any or all of, but not limited, to the steps of:

- 5 routing said job to a most available printer based on color use, pages per minute, number of pages per said job, size, and number of copies for jobs already in a queue and number of copies of said job;
- automatically splitting said job copies across a specified number of printers meeting specific criteria;
- 10 automatically splitting a single long job across more than one of said printers;
- supporting mixed groups of said printers, wherein each of said groups represents a different make or model;
- monitoring print job status and redirecting said job if an error occurs;
- supporting job scheduling, allowing said user to specify said job priority, a rush job,
- 15 and rip and print scheduling in advance; and
- supporting specified non-proprietary black and white printers.
10. The method of Claim 9, wherein said rush job requires a user password.
- 20 11. The method of Claim 9, wherein said advance scheduling is up to one week.
12. A system for raster image processing (RIP), using an RIP printer software application installed on a networked computer, said RIP application adaptable to coordinate with a plurality of other component printer software applications associated with one or more
- 25 printers, and said RIP application having at least one filter, comprising,
- means for selecting said RIP application to print a job;
- means for sending said job to said RIP application;
- means for said filter parsing said job into one or more print pieces; and
- means for forwarding said print pieces to said one or more designated printers.
- 30 13. The system of Claim 12, further comprising an engine if said networked computer is a proprietary server.
14. The system of Claim 12, wherein said other component printer applications
- 35 comprise an optimum print job balancing component.
15. The system of Claim 12, further comprising means for determining, interpreting, and implementing job PPD settings.

- 5 16. The system of Claim 12, wherein said RIP application works with a plurality of proprietary utilities.
17. The system of Claim 16, wherein said plurality of proprietary utilities comprises, but is not limited to:
- 10 a driver utility for a user to interact with said RIP application; and
a reporting utility for reporting job status and designated printer locations for said printer pieces.
18. The system of Claim 17, wherein said driver utility lists some or all of PPD options
- 15 associated with said other component printer applications.
19. The system of Claim 18, wherein said PPD options apply on a per-job basis.
20. The system of Claim 14, by said optimum print job balancing component, further comprising any or all of, but is not limited to:
- means for routing said job to a most available printer based on color use, pages per minute, number of pages per said job, size, and number of copies for jobs already in a queue and number of copies of said job;
- means for automatically splitting said job copies across a specified number of
- 25 printers meeting specific criteria;
- means for automatically splitting a single long job across more than one of said printers;
- means for supporting mixed groups of said printers, wherein each of said groups represents a different make or model;
- 30 means for monitoring print job status and redirecting said job if an error occurs;
- means for supporting job scheduling, allowing said user to specify said job priority, a rush job, and rip and print scheduling in advance; and
- means for supporting specified non-proprietary black and white printers.
- 35 21. The system of Claim 20, wherein said rush job requires a user password.
22. The system of Claim 20, wherein said advance scheduling is up to one week.
23. A method for raster image processing (RIP), using an RIP printer software
- 40 application installed on a networked computer, said RIP software having PPD options, said

- 5 RIP application adaptable to coordinate with a plurality of other component printer software applications associated with one or more printers, and said RIP application having at least one filter, comprising the steps of:

a user setting appropriate PPD options for a job using a driver utility, said utility interacting with said RIP software;

- 10 said user selecting to use said RIP printer application;
sending said print job to said RIP printer application;
said RIP application making print load balancing decisions;
said RIP application sending said print job to said appropriate one or more printers;
said user determining said appropriate one or more printers by using a second
15 utility; and

redirecting said job to one or more other printers according to error protocol procedures if an error occurs, wherein said redirection is reflected in said second utility.

- 20 24. A system for raster image processing (RIP), using an RIP printer software application installed on a networked computer, said RIP software having PPD options, said RIP application adaptable to coordinate with a plurality of other component printer software applications associated with one or more printers, and said RIP application having at least one filter, comprising:

25 means for a user setting appropriate PPD options for a job using a driver utility, said utility interacting with said RIP software;

- means for said user selecting to use said RIP printer application;
means for sending said print job to said RIP printer application;
means for said RIP application making print load balancing decisions;
means for said RIP application sending said print job to said appropriate one or
30 more printers;

means for said user determining said appropriate one or more printers by using a second utility; and

- means for redirecting said job to one or more other printers according to error protocol procedures if an error occurs, wherein said redirection is reflected in said second
35 utility.

25. A method for optimum print job balancing a user's print job from a networked computer, comprising any or all of, but not limited to, the steps of:

- 5 routing a job to a most available printer based on color use, pages per minute, number of pages per said job, size, and number of copies for jobs already in a queue and number of copies of said job;
automatically splitting said job copies across a specified number of printers meeting specific criteria;
10 automatically splitting a single long job across more than one of said printers;
supporting mixed groups of said printers, wherein each of said groups represents a different make or model;
monitoring print job status and redirecting said job if an error occurs;
supporting job scheduling, allowing said user to specify said job priority, a rush job,
15 and rip and print scheduling in advance; and
supporting specified non-proprietary black and white printers.

26. A system for optimum print job balancing a user's print job from a networked computer, comprising any or all of, but not limited to:

20 means for routing a job to a most available printer based on color use, pages per minute, number of pages per said job, size, and number of copies for jobs already in a queue and number of copies of said job;

means for automatically splitting said job copies across a specified number of printers meeting specific criteria;

25 means for automatically splitting a single long job across more than one of said printers;

means for supporting mixed groups of said printers, wherein each of said groups represents a different make or model;

means for monitoring print job status and redirecting said job if an error occurs;

30 means for supporting job scheduling, allowing said user to specify said job priority, a rush job, and rip and print scheduling in advance; and

means for supporting specified non-proprietary black and white printers.

5 **PRINTING METHOD AND APPARATUS HAVING MULTIPLE RASTER
 IMAGE PROCESSORS**

ABSTRACT

10 The invention provides a printing method and apparatus, comprising a software application
 that works with proprietary printing utilities, and that may include one or more additional
 software components for adding additional printing technology. The invention also
 comprises an automatic print load-balancing component in a centralized or distributed raster
15 image processing (RIP) printing environment that enables faster system performance over
 single or multiple processors.

FIG. 1
(PRIOR ART)

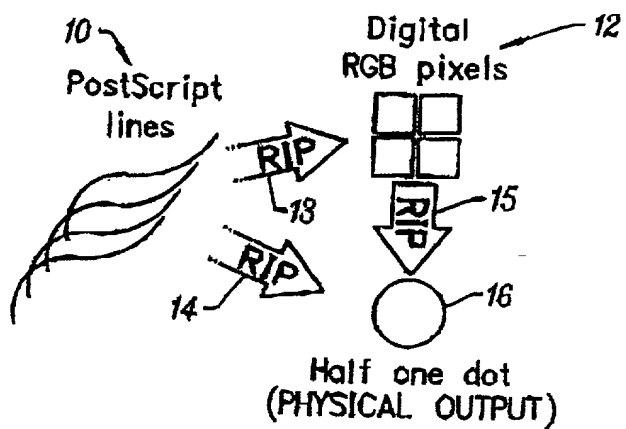
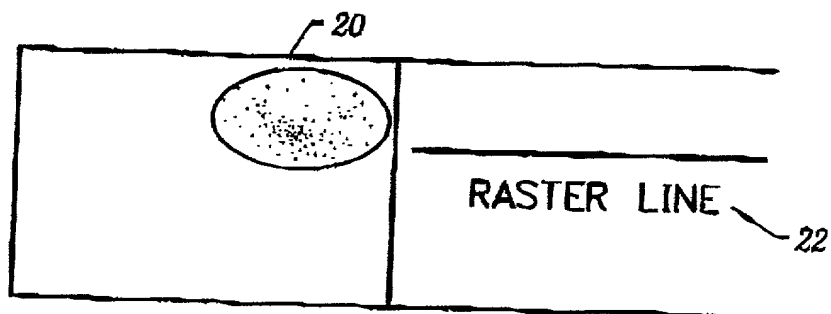


FIG. 2
(PRIOR ART)



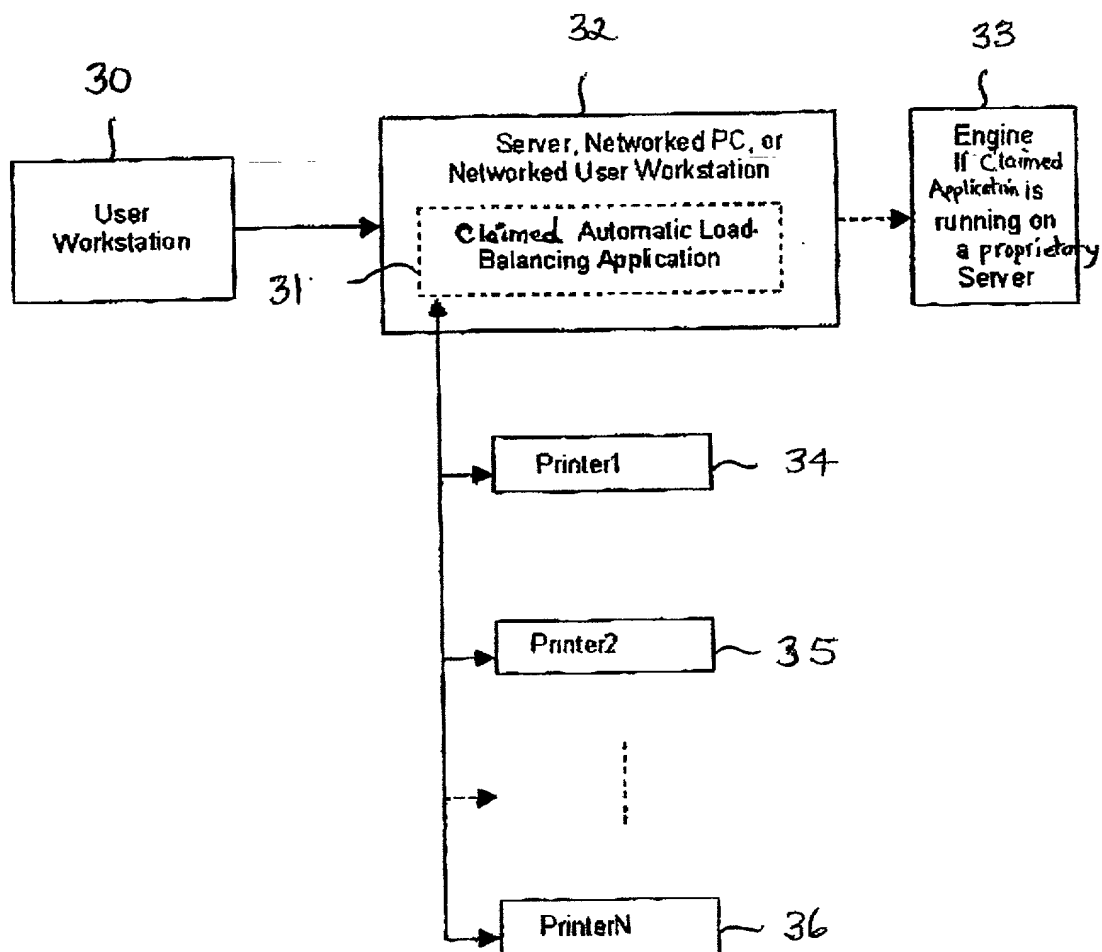


Fig. 3

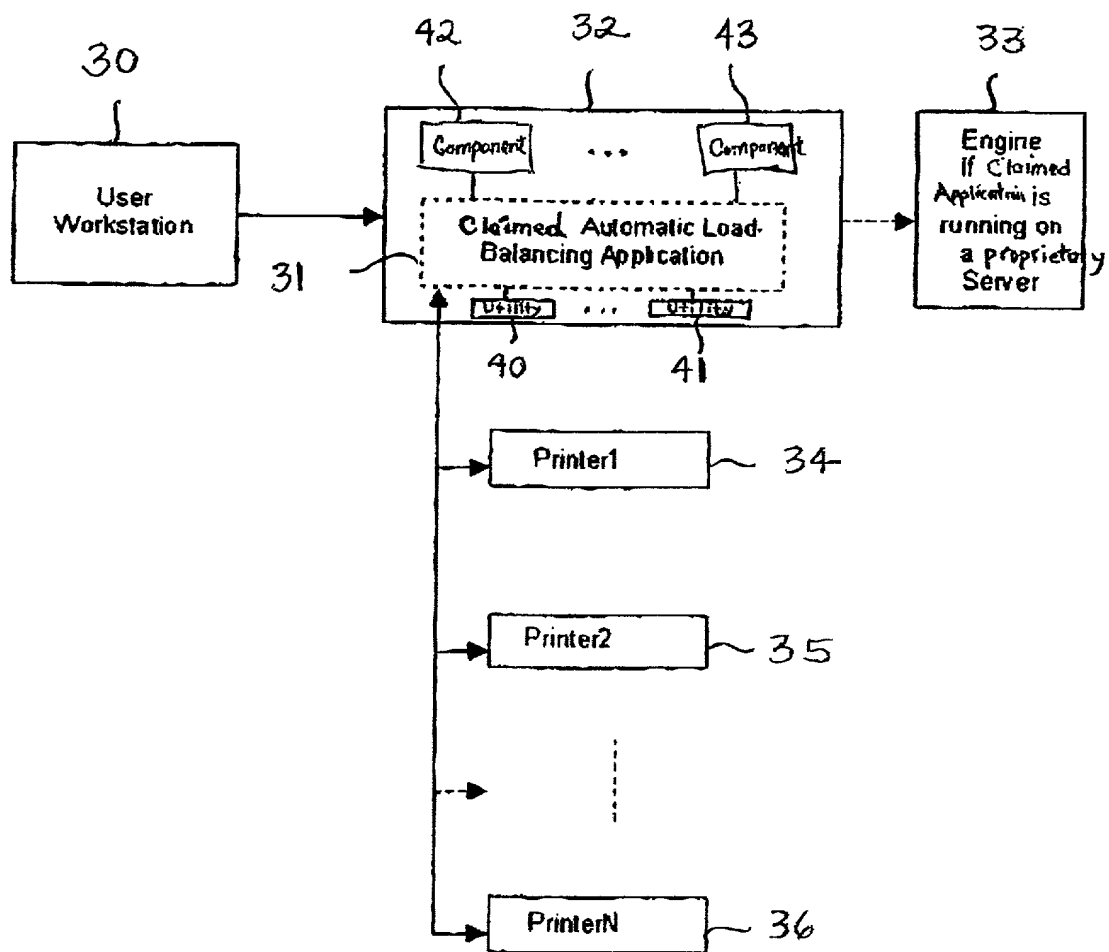


Fig. 4

DECLARATION FOR PATENT APPLICATION

As a below named inventor, we hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name;

I believe I am the original, first, and sole inventor (if only one name is listed below) or an original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

PRINTING METHOD AND APPARATUS HAVING MULTIPLE RASTER IMAGE PROCESSORS

the specification of which (check one) ☒ is attached hereto, or ☐ was filed on _____

as Application Serial No. _____ and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56(a).

=====

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)

Priority Claimed
Yes No

Number Country Day/Month/Year Filed

Number Country Day/Month/Year Filed

=====

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith:

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DONALD M. HENDRICKS, Reg. No. 40,355
KIRK D. WONG, REG. NO. 43,284
EARLE W. JENNINGS, Reg. No. 44,804
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SEND CORRESPONDENCE TO:

MICHAEL A. GLENN, 3475 Edison Way, Ste. L., Menlo Park CA 94025

=====

I hereby claim the benefit under Title 35, United States code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, Section 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

09/298,639 4/23/99 Pending
Application Ser. No. Filing Date Status: Patented, Pending, Abandoned

=====

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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